If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match. The on-screen version of the Collider-Accelerator Department Procedure is the Official Version. Hard copies of all signed, official, C-A Operating Procedures are available by contacting the ESSHQ Procedures Coordinator, Bldg. 911A

C-A OPERATIONS PROCEDURES MANUAL

(Collider Electrical Power Supply Group Procedure CPS-009)

Note: This document was formerly a C-A Group Procedure. The content of the group procedure was reviewed by the Technical Supervisor. All approvals and/or issue dates of the original group procedure are maintained for present use.

15.2.9 Lockout Procedure for the Yellow IR Dipole Nested Power Supplies or QPA's During Running Periods When a Power Supply Must be Repaired

Text Pages 3 through 7

Appendices Pages 8 through 17

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approved: _____***Signature on File***_____ _____
Collider-Accelerator Department Chairman Date

D. Bruno

BROOKHAVEN NATIONAL LABORATORY

Procedure: C-A-CPS-009
Revision: 02
Revision Date: 01/11/07

COLLIDER-ACCELERATOR DEPARTMENT

Title: Lockout Procedure for the **Yellow** IR Dipole Nested Power Supplies or QPA's During Running Periods When a Power Supply Must be Repaired

Author: D. Bruno

Group: Collider Power Supply

Group Leader concurrence indicates procedure is still current.

Group Leader: Donald Bruno *Signature on File* Date: 1/11/07

This Procedure Must Be Reviewed By The Technical Supervisor Prior to use.
If This Procedure Does Not Reflect Current Equipment/Processes
Then Immediately Notify The Group Leader

Lockout Procedure for the Yellow IR Dipole Nested Power Supplies or QPA's During Running Periods When a Power Supply Must be Repaired

1. Purpose

1.1 This procedure provides instructions to the Collider Electrical Power Supply Group (CEPSG) technicians and the Collider-Accelerator Support (CAS) technicians on the proper lockout that must be done before you repair a nested Yellow IR dipole power supply (p.s.) or QPA.

Caution:
This lockout procedure can only be used in preparation to repair a Nested Yellow IR Dipole P.S. or QPA during running periods. See Appendix 1 for a complete list of the sitewide names of these Nested Yellow IR Dipole P.S's and QPA's. If the sitewide name of the Yellow p.s. or QPA that must be repaired is on the list in Appendix 1 then you can use this procedure.

1.2 C-A Policy states that the preferred method to protect workers from energy sources is Lockout-Tagout (LOTO). There is no need to place a tag on the lock if the lock will not stay on past 1 shift or overnight as is consistent with standard LOTO Procedures.

1.3 Running Periods are defined as those periods when the C-A Main Control Room (MCR) has a scheduled operator on watch 24 hours a day and beam is being delivered or beam is being prepared to be delivered to RHIC.

2. Responsibilities

2.1 Responsibilities of the CEPSG and CAS Technicians

2.1.1 Any CEPSG and CAS Technicians preparing to repair a Nested Yellow IR Dipole P.S. or QPA shall apply their lock, as described in section 5, to assure their own safety.

2.2 Responsibilities of System Specialists

2.2.1 System Specialists are responsible for training the CEPSG and CAS Technicians.

3. Prerequisites for the CEPSG and CAS Technicians

3.1 The CEPSG and CAS Technicians must be trained in LOTO.

3.2 The CEPSG and CAS Technicians must be trained in the use of this procedure and their name must appear on a list maintained by Don Bruno and Bill Anderson. This list is attached in Appendix 4 and will be updated as more people are trained. The training is valid for 1 year.

3.3 The CEPSG and CAS Technicians must be trained in Electrical Safety.

3.4 The CEPSG and CAS Technicians must wear leather gloves, safety glasses, natural fiber long sleeve shirt and natural fiber long pants when using this procedure for class 0+ hazards. If the hazard is a class 2 then the CEPSG and CAS Technicians must wear cotton underwear, fire retardant long-sleeve shirt and long pants, hardhat with arc rated face shield, safety glasses, leather gloves, leather shoes and hearing protection. If the hazard is a class 4 then the CEPSG and CAS Technicians must wear cotton underwear, FR long-sleeve shirt and FR long pants, hardhat, safety glasses, leather gloves, leather shoes and hearing protection plus multilayer flash suit, and flash suit hood.

4. Precautions for the CEPSG and CAS Technicians

4.1 If the repair of the Nested Yellow IR Stand alone Dipole p.s. is in the DC compartment or if you must work on the isolation amplifier board then this procedure must be used. See Figure 1 in Appendix 2 for a photo of the location of the isolation amplifier board. The isolation amplifier board has a cover on it which is not shown in Figure 1. If the repair is in the upper front AC compartment then you can just lockout the 480VAC to the p.s. Turning off the 480V circuit breaker on the front of the p.s. is a class 2 hazard and locking out the 480VAC disconnect, that feeds this p.s., is a class 4 hazard. Verifying the 480VAC is locked out is a class 4 hazard.

4.2 If the repair is in the lower front control compartment then you can just lockout the 480VAC to the p.s. because the isolation amplifier board is covered. See Figure 1 in Appendix 2 for a photo of the location of the isolation amplifier board (cover not shown). The lower front control compartment does not contain 480VAC. It does contain 110VAC but it goes through a control transformer. Verifying the 110VAC is not present, after locking out the 480VAC disconnect, is considered a class 0+ hazard. Locking out the 480Vac breaker on the p.s. is a class 2, on the wall, the disconnect is a class 4

5. Procedure

5.1 If you must repair a Nested Yellow IR Dipole P.S. or QPA then write down the name of this p.s. here:_____

5.2 Next consult the Appendix 1 and make sure the name is in the appendix. You have now confirmed that this p.s. or QPA is a Nested Yellow IR Dipole P.S. or QPA

Warning:
If this p.s. does not appear in Appendix 1 then STOP and consult the engineer.

5.3 Make sure the Yellow link is down before performing this lockout. MCR can tell you if the link is down. If MCR says the link is not down then tell them you will bring the link down.

5.4 Get a lock and go out and look at the p.s. or QPA that must be repaired. See Appendix 1 to find out which building the p.s. or QPA is in. At the top of the p.s. is a "rack" name even though the p.s. is not in a rack. Write down the building and rack name here:
Building_____
Rack Name_____

5.5 If the Yellow link is not down then tell MCR you will be bringing the link down but they must run all of the p.s.'s to zero current first.

5.6 Once the p.s.'s are at zero current you should put the p.s. that must be repaired into LOCAL and STANDBY from the front panel controls. Now put it in the OFF state. Use the OFF pushbutton on the front of the p.s. to do this. The Yellow link will now come down if it is not down already. If a QPA is being repaired do the same thing to its associated p.s.

5.7 Now that the p.s. is in the OFF state you can turn OFF the circuit breaker on the front of this p.s. (class 2).

5.8 Lockout the 480VAC disconnect (class 4) that feeds this p.s.. Check off that it has been locked out here:
_____ (Locked out 480VAC Disconnect)

5.9 Go to service building 1004B and turn off the following Yellow main dipole power supplies control switches (class 0+) (next step is lockout):
PYDR_____ (CHECK AFTER TURNED OFF)
PYDFT_____ (CHECK AFTER TURNED OFF)

5.10 You turn off these main p.s.'s out by turning the red front panel switch to the left. Watch that the lights on the control chassis go off. See Appendix 2 Figure 2 for a photo of the switch.

5.11 Before locking out the 480V disconnects observe 480V on all three line to line voltages on the volt meters on the front of the power supplies. Next, make sure all of the lights are flashing on the voltage monitor gauges on the back of the p.s. After you lock out the 480V disconnect switch make sure all three line to line voltages on the volt meters on the front of the power supplies read zero. Next make sure all of the lights are flashing are OFF on the voltage monitor gauges on the back of the p.s

5.12 In 1004B lockout the following Yellow main dipole power supplies 480V disconnect switches. The SYDFT 480V switch is located along the building parking lot wall. See Appendix 2 Figure 3. The SYDR 480V switch is located across from the rollup door and is a big stand alone 480V switch at the end of the row of main p.s.'s. See Appendix 2 Figure 4. These have kirklocks so take the key with you after the switch is locked out:
SYDR_____ (class 4) (CHECK AFTER LOCKED OUT)
SYDFT_____ (class 4) (CHECK AFTER LOCKED OUT)

5.13 To lock out the SYDR disconnect you press the red button and it will trip the disconnect switch. See Appendix 2 Figure 5. Move the lever over the OFF pushbutton and remove the kirk key. There is a special procedure for turning this switch on again. First unlock it with the kirk key. Next move the lever off the top of the off pushbutton. Next you will see a box with numbers in it. Next you crank the big black switch all the way to the left, as far as you can go. Next you crank it all the way to the right as far as you can go. Now you see the number one in the window. Repeat this cranking procedure and then you see the number 2. Repeat this procedure one more time and you will hear a bang on the 3rd time. The switch is now closed.

5.14 Go to service building 1010A and lockout the following Yellow Quench Switches (both class 0+) See Appendix 3 for photos:
R10ADS5 (near valve boxes)____ (CHECK AFTER LOCKED OUT)
R10ADS4 (near valve boxes)____ (CHECK AFTER LOCKED OUT)

5.15 Go to the rack labeled R10ADS5 first. This is located near the valve boxes. This is also known as the Yellow sector 9 dipole quench protection switch. Find the UPS made by APC in this rack. It also says "Smart UPS 3000" on it. Press the button with the "**o**" on it to turn it OFF. See Appendix 3 Figure 1.

5.16 Right above this UPS is a panel with a black switch (class 0+). Turn it to the OFF position. It is very stiff (careful not to break it) but if you turn it hard enough it will turn. See Appendix 3 Figure 2. Put a lockout tree through this switch and then a lock on the tree.

5.17 Repeat this procedure for rack R10ADS4 to lock out this quench switch in this rack. This means turn off the UPS, with the button, and the turn the black switch to the OFF positions and lock it out.

5.18 After you have completed repairing the p.s. or QPA you can now unlock the 480VAC disconnect for the p.s. you were working on and turn ON the circuit breaker on the p.s.

5.19 Now you can unlock the quench switches in 1010A. First turn on the black switch on the panel on top of the UPS for R10ADS5. Second press the button on the UPS that says “test” on it. The UPS should now turn back on. Repeat this procedure for rack R10ADS4.

5.20 Next, you can now unlock the main p.s.’s and then restore the regulator to operational conditions. Restore the main p.s. regulator by following this procedure:
http://www.c-ad.bnl.gov/ceps/files/pdf/Unlock%20and%20Restore%20MPS.pdf

5.21 If there is a problem getting the above link to work in 5.20 then the procedure in 5.20 is called “Unlocking and Restoring Main Power Supplies”. It can be found by going to this web page:
http://www.c-ad.bnl.gov/ceps/Mains.htm

5.22 Once you are done restoring the regulator for the main p.s.’s, tell MCR that they can now bring up the Yellow link up.

Appendix 1
NESTED RHIC YELLOW IR Dipole Power Supplies

BUILDING 1002B	
P.S. Name	**Rack Number**
Y2-DH0-PS	R2BD1
BUILDING 1004B	
P.S. Name	**Rack Number**
Y4-DH0-PS	R4BD1
BUILDING 1006B	
P.S. Name	**Rack Number**
Y6-DH0-PS	R6BD1
BUILDING 1008B	
P.S. Name	**Rack Number**
Y8-DH0-PS	R8BD1
BUILDING 1010A	
P.S. Name	**Rack Number**
YO9-DH0-PS	R10AD2
YI10-DH0-PS	R10AD6
BUILDING 1012A	
P.S. Name	**Rack Number**
Y12-DH0-PS	R12AD1

Appendix 1 (continued)
NESTED RHIC YELLOW IR Dipole QPA's

BUILDING 1002B	
P.S. Name	**Rack Number**
Y2-DH0-QP	R2BD1
BUILDING 1004B	
P.S. Name	**Rack Number**
Y4-DH0-QP	R4BD1
BUILDING 1006B	
P.S. Name	**Rack Number**
Y6-DH0-QP	R6BD1
BUILDING 1008B	
P.S. Name	**Rack Number**
Y8-DH0-QP	R8BD1
BUILDING 1010A	
P.S. Name	**Rack Number**
YO9-DH0-QP	R10AD2
YI10-DH0-QP	R10AD6
BUILDING 1012A	
P.S. Name	**Rack Number**
Y12-DH0-QP	R12AD1

Appendix 2

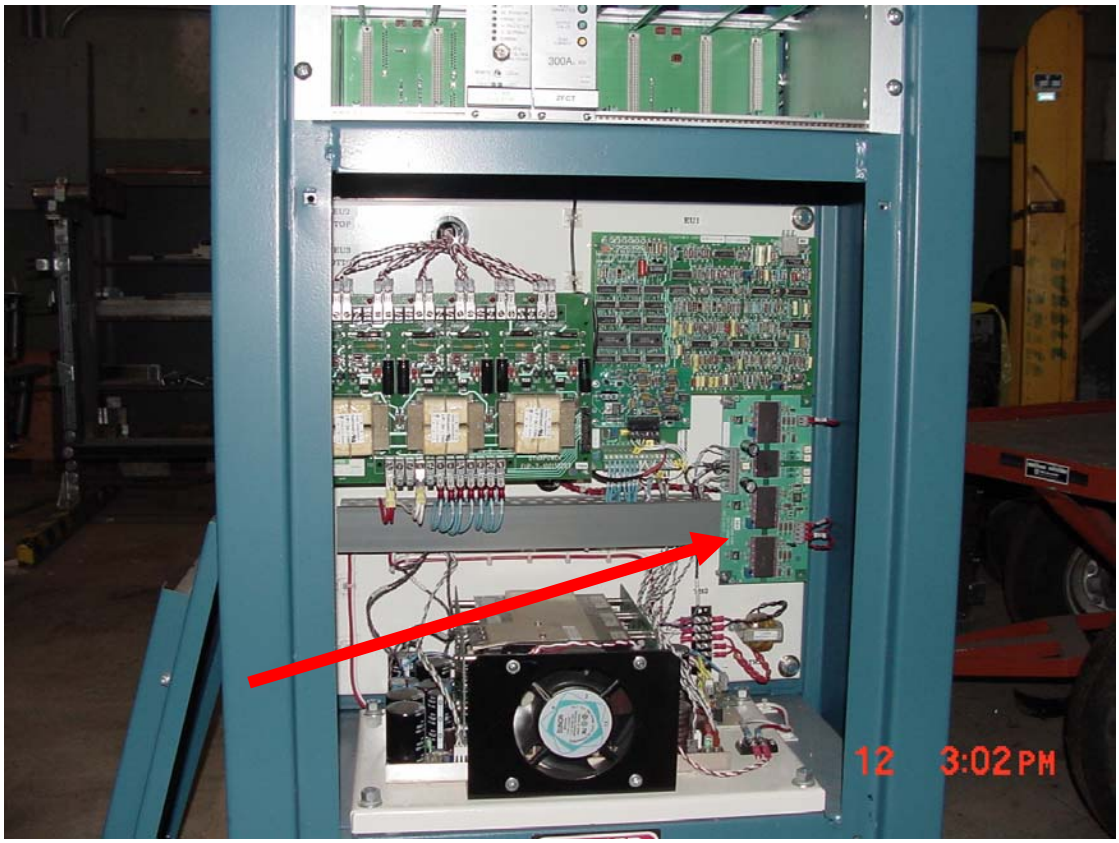

Figure 1: Photo of Isolation Amplifier board in lower front Control Compartment of Stand Alone p.s. (cover not shown).

The RED arrow is pointing at the isolation amplifier board

Appendix 2 (continued)

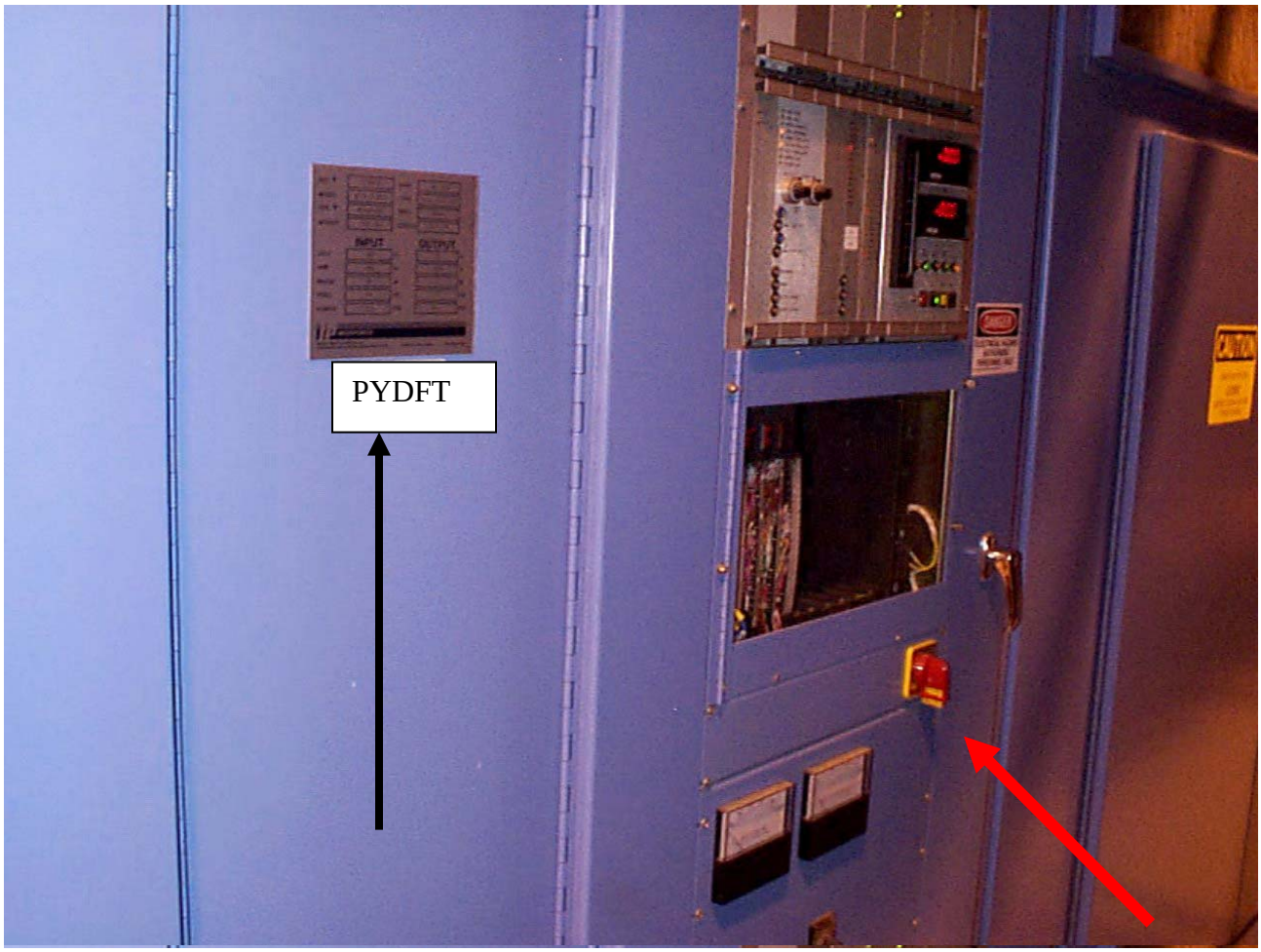

Figure 2: Photo of one RED Front Panel Switch for the PYDFT Main p.s.

The Red Arrow is pointing to the RED switch you must turn off for the main p.s. PYDFT

The Black Arrow is pointing to the label that tells you which p.s. this is.

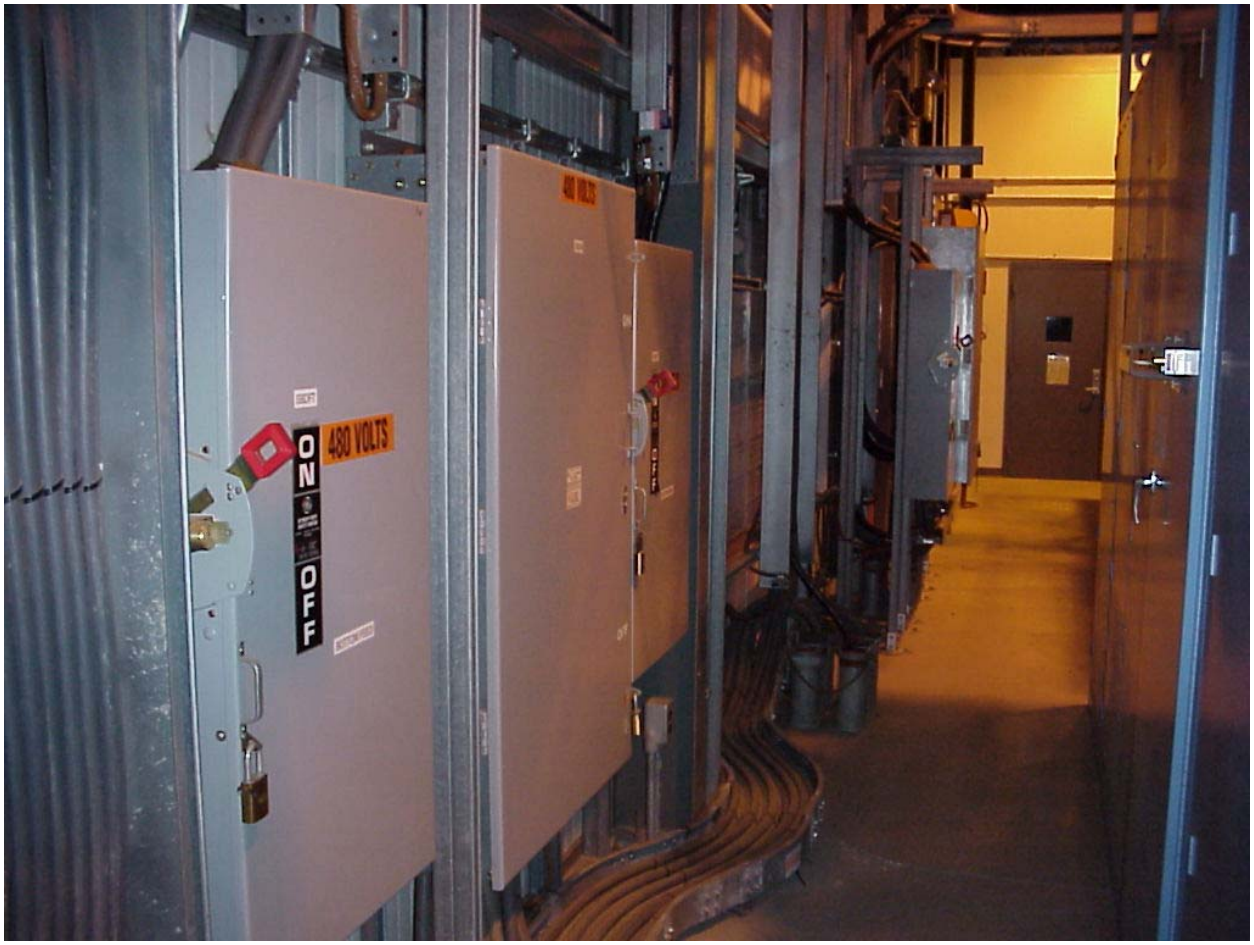

Figure 3: 480V disconnect switches for main quadrupole p.s.'s and main dipole flattop power modules along parking lot wall

Figure 4: 480V disconnect switches for main dipole ramp power modules. The one on the left is SYDR and the one on the right is SBDR.

Lever you move over OFF push button for lock out.

On Indication

Number to look at when closing switch, after you are done with work. This number changes when you crank switch.

Number=0 now. This is the number you look at that will change from 0 to 1 to 2 and then on 3 the switch will bang close.

Figure 5: Close up of disconnect switch for SYDR.

Off push button

Switch you crank to close switch when you are done and ready to turn switch back on. Crank it 3 times to turn switch back on. Watch the number in the window change

Appendix 3 (see next page for more)
Photos of one part of 6000Amp Quench Switch that is part of Lockout

Figure 1 : UPS (see it says APC on it)

Figure 2: Panel on top of UPS with black switch.

Appendix 3 (continued)
Photos of one part of 6000Amp Quench Switch that is part of Lockout

Figure 3: Photo of all four 6000Amp Quench Switches in 1010A

Figure 4: Photo of top of one Quench Switch showing name of rack

Appendix 4

Lockout Procedure For the Yellow IR Dipole Nested Power Supplies During Running Periods When a Power Supply Must be Repaired

List of People Trained. Training is valid for 1 year

Name	Date Trained